



Smokestack Monitor

The Environmental Protection Agency (EPA) monitors emissions from industrial smokestacks to obtain such information as how much pollutant material is being discharged into the atmosphere, how rapidly it is being discharged, and how the smoke plume disperses after leaving the stack. Until recently, this was a costly and time consuming job. EPA had to make arrangements with plant officials to avoid disrupting operations, install sensors on the smokestacks, take samples for later analysis, then remove the sensors. These multiple steps have been eliminated by an aerospace spinoff called the Mobile Laser System, which EPA put into operation last year.

Installed in a van, the system uses a laser beam to monitor smokestack plumes from as far away as 3,000 feet.

The Mobile Laser System is an offshoot of Laser Doppler Velocimeter (LDV) technology originally developed by Marshall Space Flight Center for measuring airflow disturbances in wind tunnels and in flight. One of Marshall's LDV contractors was Raytheon Company's Equipment Division, Wayland, Massachusetts. Marshall and Raytheon teamed to adapt LDV technology to EPA's need; Raytheon designed and built the new system.

The upper photo—taken during 1979 acceptance tests at Duke Power, North Carolina—illustrates how the Mobile Laser System works. In the photo, an invisible laser beam is measuring emissions from one of the stacks; aimed from the van's interior (lower photo), the beam is projected from the roof-mounted scanning pod near the rear of the vehicle. Particles in the smoke coming out of the stack reflect the beam back to light-detecting equipment in the van. The frequency of the returned beam is different from that of the outgoing beam; analysis of the difference in frequencies—called the "doppler shift"—allows determination of the velocity of the material being discharged, together with the amount and size of the particles emitted. The laser also measures wind velocity and direction, enabling computation of smokestack plume dispersion downwind of the power plant. The system offers multiple advantages: it is economical, provides instant data, is self-contained and easily movable, and can be used at any time without interfering with plant operations.

